



(11) **EP 2 764 853 A1**

(12) **EUROPEAN PATENT APPLICATION**  
published in accordance with Art. 153(4) EPC

(43) Date of publication:  
**13.08.2014 Bulletin 2014/33**

(51) Int Cl.:  
**A61F 5/045<sup>(2006.01)</sup>**

(21) Application number: **12839956.5**

(86) International application number:  
**PCT/CN2012/082655**

(22) Date of filing: **09.10.2012**

(87) International publication number:  
**WO 2013/053311 (18.04.2013 Gazette 2013/16)**

(84) Designated Contracting States:  
**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR**

(72) Inventors:  
• **ZHANG, Jilin**  
**Beijing 100085 (CN)**  
• **ZHANG, Yi**  
**Beijing 100085 (CN)**

(30) Priority: **09.10.2011 CN 201110300155**

(74) Representative: **Wilson Gunn**  
**Blackfriars House**  
**The Parsonage**  
**5th Floor**  
**Manchester M3 2JA (GB)**

(71) Applicants:  
• **Beijing 3-D Ortho Base Invention S&T Co., Ltd.**  
**Beijing 100085 (CN)**  
• **Zhang, Jilin**  
**Beijing 100085 (CN)**

(54) **THREE-DIMENSIONAL SPINE CORRECTION ROBOT**

(57) A three-dimensional spine correction robot comprises: a pillar (1), a seat (2), a plurality of human body fixing belts (302), a head fixing apparatus, a bracket (9), a plurality of pillar casing pipes (3), a spine lateral push-and-pull apparatus (6) and a seat locking mechanism (10). The head fixing apparatus is fixed on the top of the bracket (9). The pillar casing pipes (3) are sleeved over the pillar (1) in a movable manner, and each pillar casing pipe (3) is connected to a human body fixing belt (302). The lower end of the pillar casing pipe (3) is connected to the seat (2), and the upper end thereof is connected to the pillar (1). A first elastic connection object (301) is connected between the pillar casing pipes (3). The spine lateral push-and-pull apparatus (6) may move up and down along the pillar (1) and swing. The seat (2) is connected to the pillar (1) through a bearing, and may move up and down along the pillar (1). The seat locking mechanism (10) is fixed between the bracket (9) and the seat (2). The three-dimensional spine correction robot is characterized in that the therapy location is accurate, and action indexes such as therapy strength, amplitude and speed may be precisely quantified.

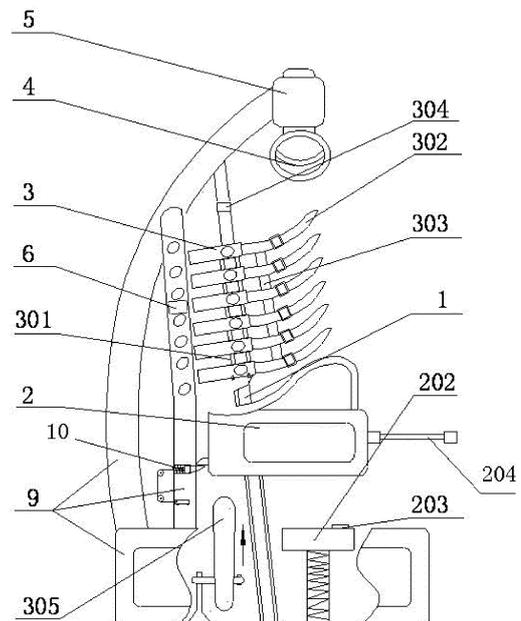


Figure 1

**EP 2 764 853 A1**

**Description****TECHNICAL FIELD**

**[0001]** The present invention relates to the field of medical appliances and in particular to a three-dimensional spine correction robot used for treatment of spinal intervertebral diseases and for spine care.

**BACKGROUND OF THE INVENTION**

**[0002]** Spinal intervertebral soft tissue injury diseases, "intervertebral diseases" for short, including cervical spondylosis, prolapse of lumbar intervertebral disc, thoracic and lumbar posterior articular disorders and other spine-related diseases, are commonly and frequently encountered diseases, which have serious adverse effect on human health. Although the clinical manifestations of intervertebral diseases vary, the etiologies, pathologies and therapeutic principles thereof are basically the same. After many years of clinical research, the inventor believes the main cause of the diseases is adverse mechanical behaviors, like excessive spinal movement, overloading, etc., which result in the change (unbalance) of three-dimensional directions of intervertebral relative position and the injury of intervertebral soft tissue, especially the injury of the nerve roots and blood vessels from and to nerve root canals. Protrusion of intervertebral disc is just a manifestation of intervertebral soft tissue injury, instead of the main cause of the diseases. As the natural state is the optimal state, the preferred method for treatment of the diseases should be the most minimally invasive correction therapy, i.e., using a force without intervening in the human body to ensure the spinal intervertebral structure returns to or approaches the natural state. The surgical therapy is used only when the non-surgical therapy is ineffective.

**[0003]** As an indisputable fact, a plurality of doctors use the mechanical therapy, such as pulling, rotating, pushing, pressing and other hand techniques, to treat spinal intervertebral diseases including prolapse of lumbar intervertebral disc, etc., with obvious curative effect. Other than Chinese bone-setting massage techniques, US chiropractic techniques, European bone-setting techniques and the spine correction techniques of Japan, Thailand and Korea are also widely used and have obvious effect. The key steps thereof only include pulling, rotating, bending, extending, pressing, pushing, etc., which in essence belong to the mechanical therapy whereof the expression forms are pulling, pressing, bending, cutting and twisting. Most of the key therapies use the "sudden load", i.e., applying an appropriate sudden force for a patient without counteraction. With convenience and effectiveness as common features, the techniques often, quickly and effectively, heal the patients with mild diseases or getting the diseases for the first time.

**[0004]** However, the massage treatment and traction

treatment also have many disadvantages, mainly including: 1) Impossible to be parameterized or quantified, various actions thereof belong to a mechanical therapy that is subject to the experience of therapists and is not accurate in terms of strength, wherein no curative effect is achieved if the strength or extent is too small and an injury may be caused if the strength or extent is too large; 2) As the intervertebral joint displacement or dislocation is three-dimensional directional, a therapist can only apply a unidirectional or bidirectional force each time in the massage of bone setting and is unable to apply a three-dimensional force on the lesion; 3) Although various traction devices are used in the traction treatment, all the devices carry out traction in a linear manner by controlling the traction force, instead of the distance, without sudden load, wherein the traction force is evenly distributed between the vertebrae and inaccurately positioned. Therefore, the effect of the massage and traction treatment is limited. In addition, the cycle of treatment course is too long and the curative effect for serious patients is not good.

**SUMMARY OF THE INVENTION**

**[0005]** In order to resolve the problems like poor effect, long cycle, etc. in the traditional massage and traction treatment for intervertebral diseases, the present invention provides a three-dimensional spine correction robot that may enhance the function of spine care and improve the comfort level and accuracy of the treatment. The three-dimensional spine correction robot comprises a pillar, a seat, a plurality of human body fixing belts, a head fixing apparatus, and a bracket, said head fixing apparatus is fixed on the top of the bracket, said three-dimensional spine correction robot further comprises a plurality of pillar casing pipes, a spine lateral push-and-pull apparatus and a seat locking mechanism; the pillar casing pipes are sleeved over the pillar in a movable manner, and each pillar casing pipe is connected to a human body fixing belt; the lower end of the pillar casing pipe is connected to the seat, and the upper end thereof is connected to the pillar; a first elastic connection object is connected between the pillar casing pipes; the spine lateral push-and-pull apparatus may move up and down along the pillar and swing; the seat is connected to the pillar through a bearing, and may move up and down along the pillar; and the seat locking mechanism is fixed between the bracket and the seat.

**[0006]** Said three-dimensional spine correction robot further comprises a lifting platform, the lifting platform is located below the seat and used to adjust the descent distance of the seat.

**[0007]** The lifting platform is connected to a displacement sensor for monitoring the descent distance of the seat.

**[0008]** Said three-dimensional spine correction robot further comprises an overall casing-pipe retractor device fixed between the upper end of the pillar casing pipe and

the upper end of the pillar.

**[0009]** A second elastic connection object is connected between the human body fixing belts.

**[0010]** The head fixing apparatus comprises a helmet and a helmet rotation mechanism, the helmet rotation mechanism is fixed on the top of the bracket and connected to the helmet; the helmet is used to fix the head of a patient and to make quantitative rotation through the helmet rotation mechanism.

**[0011]** A weight or mechanical force is loaded around or below the seat.

**[0012]** A push rod is fixed and connected to one side of the seat to rotate the seat.

**[0013]** The spine lateral push-and-pull apparatus comprises a push-and-pull mechanism, a vertical positioning mechanism and a horizontal positioning mechanism; the vertical positioning mechanism may move up and down along the bracket and is fixed to the bracket; the push-and-pull mechanism comprises a push-and-pull rod and a driving mechanism for driving the push-and-pull rod, the bottom of the driving mechanism may be fixed in the sliding groove of the horizontal positioning mechanism in a movable manner.

**[0014]** Said three-dimensional spine correction robot further comprises a seat resetting mechanism so that the seat is capable of being returned to the initial position thereof.

**[0015]** Overcoming the disadvantages of treatment of cervical vertebrae, thoracic vertebrae and lumbar vertebrae respectively, the three-dimensional spine correction robot provided in the present invention is characterized by a scientific and reasonable structure, complete and accurate three-dimensional actions, high controllability, short treatment course, good curative effect, no damage to normal tissue, no iatrogenic injury, no pain, safety and reliability. The three-dimensional spine correction robot provided in the present invention may fix the dislocation between vertebrae, reduce the adhesion between the nerve roots and the surrounding tissue thereof, and ensure the intervertebral structure returns to or approaches the natural state. The three-dimensional spine correction robot provided in the present invention may not only be used for treatment of spinal intervertebral diseases, but also for spine care and healing degenerative spines.

## BRIEF DESCRIPTION OF THE FIGURES

### **[0016]**

Figure 1 is a side schematic structural view of the three-dimensional spine correction robot provided in the preferred embodiment of the present invention; Figure 2 is a front schematic structural view of the three-dimensional spine correction robot provided in the embodiment of the present invention; Figure 3 is a schematic structural view of the seat locking mechanism in the embodiment of the present invention;

Figure 4 is a top view of the spine lateral push-and-pull apparatus in the embodiment of the present invention.

## 5 DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

**[0017]** The technical scheme of the present invention is further described below through the accompanying drawings and the preferred embodiment.

**[0018]** Referring to Figure 1 and Figure 2, the preferred embodiment of the present invention provides a three-dimensional spine correction robot that may cure spinal intervertebral diseases, enhance the function of spine care and improve the comfort level and accuracy of the treatment. The three-dimensional spine correction robot comprises a pillar 1, a seat 2, a plurality of human body fixing belts 302, a head fixing apparatus, a bracket 9, a plurality of pillar casing pipes 3, a spine lateral push-and-pull apparatus 6, an overall casing-pipe retractor device 304 and a seat locking mechanism 10, wherein the head fixing apparatus is fixed on the top of the bracket 9; the pillar casing pipes 3 are sleeved over the pillar 1 in a movable manner, and each pillar casing pipe 3 is connected to a human body fixing belt 302; the lower end of each pillar casing pipe 3 is connected to the seat 2, and the upper end thereof is connected to the pillar 1; the pillar casing pipes 3 are interconnected by a first elastic connection object 301, such as steel spring, which may ensure the degenerative intervertebral discs of a patient align with the section, thus ensuring the force for spine correction is mainly applied to the lesion; the spine lateral push-and-pull apparatus 6 may move up and down along the pillar 1 and swing; the seat 2 is connected to the pillar 1 through a bearing, and may move up and down along the pillar 1; and the seat locking mechanism 10 is fixed between the bracket 9 and the seat 2.

**[0019]** The three-dimensional spine correction robot in the embodiment further comprises a lifting platform 202, the lifting platform 202 is located below the seat 2 and used to adjust the descent distance of the seat 2; the lifting platform 202 may also be connected to a displacement sensor for monitoring the descent distance of the seat 2. In practical application, the lifting platform 202 is composed of a mechanical hoist and a steel plate.

**[0020]** The three-dimensional spine correction robot further comprises an overall casing-pipe retractor device 304 fixed between the upper end of the pillar casing pipe 3 and the upper end of the pillar 1.

**[0021]** In the embodiment, the human body fixing belts 302 are interconnected by a second elastic connection object 303, which may be woven with a plurality of rubber bands or strips.

**[0022]** In the embodiment, the head fixing apparatus comprises a helmet 4 and a helmet rotation mechanism 5, the helmet rotation mechanism 5 is fixed on the top of the bracket 9 and connected to the helmet 4; the helmet 4 is used to fix the head of a patient and to make quan-

titative rotation through the helmet rotation mechanism 5; the helmet rotation mechanism 5 may be powered by a torque motor or an actuating motor.

**[0023]** The three-dimensional spine correction robot further comprises a seat resetting mechanism 305 so that the seat 2 is capable of being returned to the initial position thereof. In the embodiment, the seat resetting mechanism 305 is a cam mechanism. When the seat 2 descends and touches the trigger switch 203 thereof, which is located on the lifting platform 202, the cam starts to rotate to lift the seat 2 gradually; when the top of the cam mechanism reaches the highest point, the seat 2 returns to the initial locking position. In addition, the seat resetting mechanism 305 may also be implemented with an electromagnetic mechanism or another mechanism. The seat resetting mechanism may be implemented other than as specifically described in the preferred embodiment of the invention, provided that the seat 2 may return to the initial locking position thereof.

**[0024]** Referring to Figure 3, the spine lateral push-and-pull apparatus 6 comprises a push-and-pull mechanism 601, a vertical positioning mechanism (not shown in the figure) and a horizontal positioning mechanism 603. The vertical positioning mechanism may move up and down along the bracket 9 and is fixed to the bracket 9. The push-and-pull mechanism 601 comprises a push-and-pull rod 6011 and a driving mechanism for driving the push-and-pull rod 6011, the bottom of the driving mechanism may be disposed in the sliding groove 602 of the horizontal positioning mechanism 603 in a movable manner and fixed to a certain position in the sliding groove 602, which corresponds to the location of degenerative vertebrae. Driven by the driving mechanism, the push-and-pull rod may move forwards and backwards to cause a spine to move forwards, backwards, leftwards or rightwards or rotate by changing the point of strength, thus making quantitative displacement of certain vertebrae in order to ensure the intervertebral structure approaches the natural state. The driving mechanism may be implemented by a motor machine or a hydraulic machine.

**[0025]** Referring to Figure 4, the seat locking mechanism 10 comprises a telescopic torsion spring 1011, a toggle button 1012, a steel wire 1013, a pin 1014 and two fixed pulleys 1015, wherein the telescopic torsion spring 1011 is sleeved over the connecting rod of the pin 1014; one end of the steel wire 1013 is connected to the connecting rod of the pin 1014, and the other end thereof is connected to the toggle button 1012 through the two fixed pulleys 1015. When the treatment begins, the toggle button 1012 is flipped to pull the pin 1014 inwards via the steel wire 1013, so that the telescopic torsion spring 1011 is pressed tightly and the pin 1014 is separated from the plug welded on the seat 2, thus the seat 2 falls freely; when the toggle button 1012 is released, the telescopic torsion spring 1011 is reset to push the pin 1014 outwards; when the seat 2 is lifted up by the seat resetting mechanism 305, the plug welded on the seat 2 impacts

the pin 1014 to cause the pin to retract inwards immediately, so that the plug moves across the pin 1014 to cause the seat 2 to return to the initial position thereof.

**[0026]** In practical application, the instantaneous falling speed of the seat 2 may be increased by putting a weight around the seat 2 or fixing an external driving device between the seat 2 and the lifting platform 202. In addition, at one side of the seat 2, e.g., at the left, right or front side thereof, a push rod 204 is connected in a fixed manner to rotate the seat 2. In the embodiment, the push rod 204 is fixed and connected to the front side of the seat 2, which may be rotated in the range from 0 degree to 50 degrees according to the requirements for treatment or enhancement.

**[0027]** In practical application, each pillar casing pipe 3 has a central hole and is sleeved over the pillar 1 through the hole. The horizontal two ends of each pillar casing pipe 3 bend forwards to form an arch-like shape, and the far end thereof is connected to a human body fixing belt 302. Each pillar casing pipe 3 may be connected to a human body fixing belt 302 in a plurality of ways, such as button connection, riveted connection, stitched connection, etc.

**[0028]** In spine correction or the treatment of thoracic and lumbar intervertebral diseases, a patient should sit on the seat 2. The overall casing-pipe retractor device 304 is used to adjust the interval between the pillar casing pipes 3 according to the height of the patient, and the human body fixing belts 302 are used to fix the chest and waist respectively. According to the height, weight, pathological degree, pathological position and other conditions of the patient, the distance between the seat 2 and the point of fall and the rotation direction and angle of the seat 2 are set and adjusted to meet the requirements for treatment. Furthermore, the spine lateral push-and-pull apparatus 6 is positioned to be level with the degenerative vertebrae, and the acting point and scalability thereof are confirmed. After examination and confirmation, the action execution mechanisms may be started up to ensure the falling and rotation of the seat 2, the lateral pushing and pulling of the spine are carried out in a coordinated and synchronized manner, thus fixing the dislocation between vertebrae, correcting the locations of vertebrae and reducing the adhesion between the intervertebral soft tissue in particular, the nerve roots and the surrounding tissue thereof to ensure the intervertebral structure approaches the natural state.

**[0029]** In the treatment of cervical spondylosis, a patient should sit on the seat 2. The human body fixing belts 302 are used to fix the chest and waist respectively. According to the height, weight, pathological degree, pathological position and other conditions of the patient, the distance between the seat 2 and the point of fall is set and adjusted. Fixed by the helmet 4, the head is positioned according to the requirements for treatment; furthermore, the rotation direction and angle of the helmet rotation mechanism 5 are determined to meet the requirements for treatment. After examination and confir-

mation, the action execution mechanisms may be started up to ensure the falling of the seat, the rotation of the helmet and other actions are carried out in a coordinated and synchronized manner, thus achieving the purpose of treatment of cervical spondylosis or correction of a degenerative spine.

**[0030]** Compared to the prior art, the three-dimensional spine correction robot in the embodiment of the present invention has the following advantages:

1. Overcoming the disadvantages of treatment of cervical vertebrae, thoracic vertebrae and lumbar vertebrae respectively, the three-dimensional spine correction robot is characterized by a scientific and reasonable structure, complete and accurate three-dimensional actions, high controllability, and high operability after integration with computer programs.
2. As the distance of fast falling is subject to the height of the seat, the three-dimensional spine correction robot improves the safety and reliability while reducing noises.
3. Characterized by short treatment course, good curative effect, no damage to normal tissue, no iatrogenic injury and no pain, the three-dimensional spine correction robot may fix the dislocation between vertebrae, reduce the adhesion between the nerve roots and the surrounding tissue thereof and ensure the intervertebral structure returns to or approaches the natural state.
4. The three-dimensional spine correction robot in the present invention may not only be used for treatment of spinal intervertebral diseases, but also for spine care and healing degenerative spines.

**[0031]** The preferred embodiment further describes the objects, technical scheme and beneficial effects of the present invention in detail. It should be understood that the foregoing description is only intended to illustrate a specific embodiment of the invention and not to limit the invention. Any modification, equivalent replacement and improvement made to the embodiment without departing from the spirit and principles of the invention should fall within the protection scope of the invention.

## Claims

1. A three-dimensional spine correction robot comprises a pillar (1), a seat (2), a plurality of human body fixing belts (302), a head fixing apparatus, and a bracket (9), said head fixing apparatus is fixed on the top of the bracket (9), wherein said three-dimensional spine correction robot further comprises a plurality of pillar casing pipes (3), a spine lateral push-and-pull apparatus (6) and a seat locking mechanism (10); the pillar casing pipes (3) are sleeved over the pillar (1) in a movable manner, and each pillar casing pipe (3) is connected to a human body fixing belt

(302); the lower end of the pillar casing pipe (3) is connected to the seat (2), and the upper end thereof is connected to the pillar (1); a first elastic connection object (301) is connected between the pillar casing pipes (3); the spine lateral push-and-pull apparatus (6) may move up and down along the pillar (1) and swing; the seat (2) is connected to the pillar (1) through a bearing, and may move up and down along the pillar (1); and the seat locking mechanism (10) is fixed between the bracket (9) and the seat (2).

2. The three-dimensional spine correction robot of claim 1, wherein said three-dimensional spine correction robot further comprises a lifting platform (202), the lifting platform (202) is located below the seat (2) and used to adjust the descent distance of the seat (2).
3. The three-dimensional spine correction robot of claim 2, wherein the lifting platform (202) is connected to a displacement sensor for monitoring the descent distance of the seat (2).
4. The three-dimensional spine correction robot of claim 3, wherein said three-dimensional spine correction robot further comprises an overall casing-pipe retractor device (304) fixed between the upper end of the pillar casing pipe (3) and the upper end of the pillar (1).
5. The three-dimensional spine correction robot of claim 1 or 4, wherein a second elastic connection object (303) is connected between the human body fixing belts (302).
6. The three-dimensional spine correction robot of claim 1 or 4, wherein the head fixing apparatus comprises a helmet (4) and a helmet rotation mechanism (5), the helmet rotation mechanism (5) is fixed on the top of the bracket (9) and connected to the helmet (4); the helmet (4) is used to fix the head of a patient and to make quantitative rotation through the helmet rotation mechanism (5).
7. The three-dimensional spine correction robot of claim 1 or 4, wherein a weight or mechanical force is loaded around or below the seat (2).
8. The three-dimensional spine correction robot of claim 1 or 4, wherein a push rod (204) is fixed and connected to one side of the seat (2) to rotate the seat (2).
9. The three-dimensional spine correction robot of claim 1 or 4, wherein the spine lateral push-and-pull apparatus (6) comprises a push-and-pull mechanism, a vertical positioning mechanism and a horizontal positioning mechanism; the vertical position-

ing mechanism may move up and down along the bracket (9) and is fixed to the bracket (9); the push-and-pull mechanism comprises a push-and-pull rod and a driving mechanism for driving the push-and-pull rod, the bottom of the driving mechanism may be fixed in the sliding groove of the horizontal positioning mechanism in a movable manner.

5

10. The three-dimensional spine correction robot claim 1 or 4, wherein said three-dimensional spine correction robot further comprises a seat resetting mechanism (305) so that the seat (2) is capable of being returned to the initial position thereof.

10

15

20

25

30

35

40

45

50

55

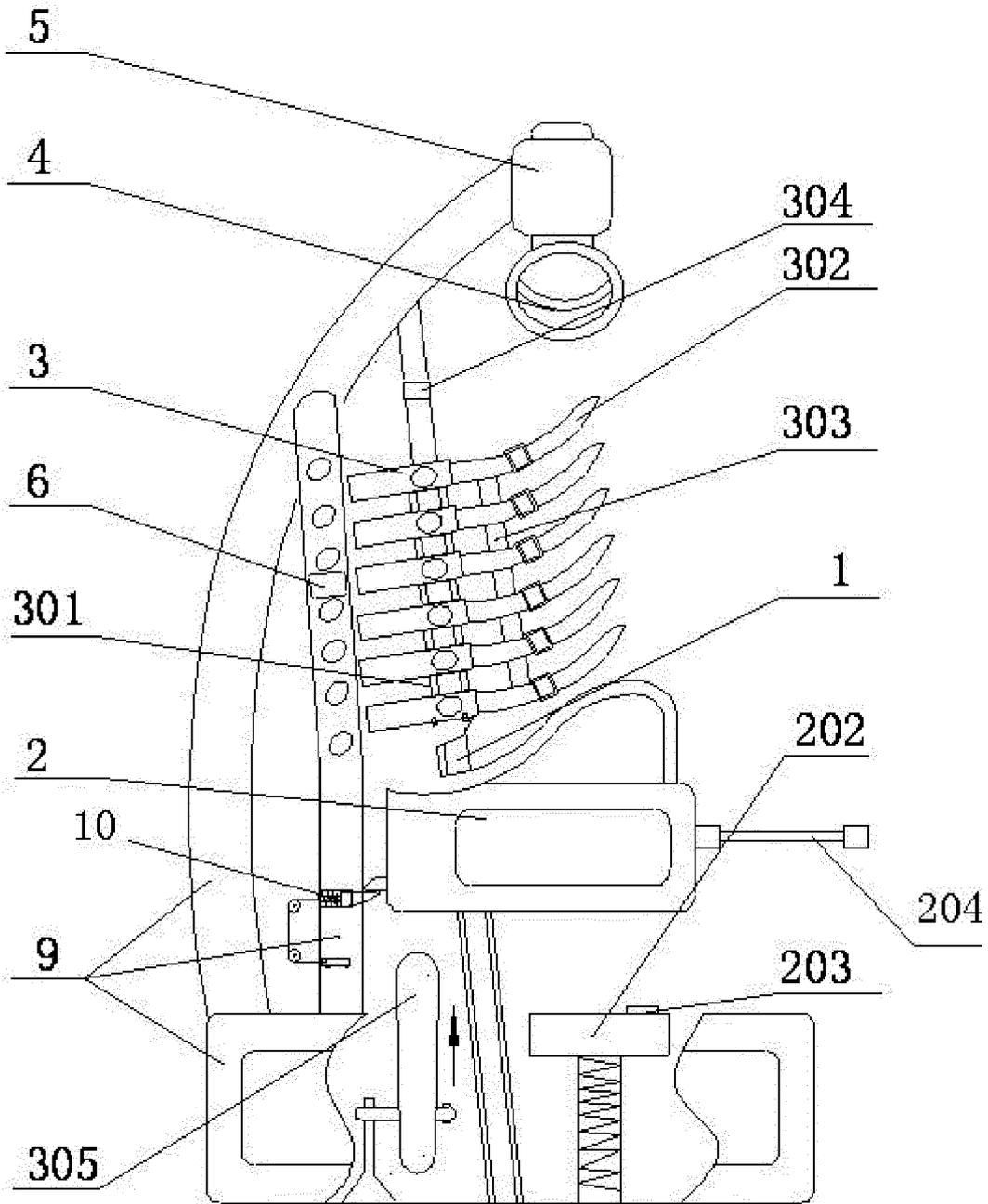


Figure 1



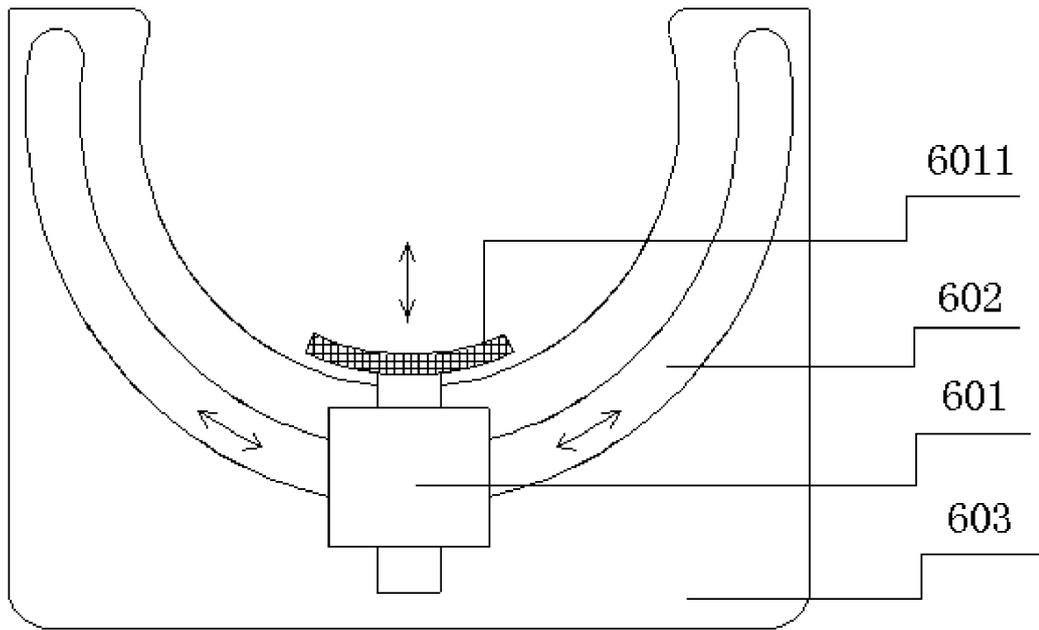


Figure 3

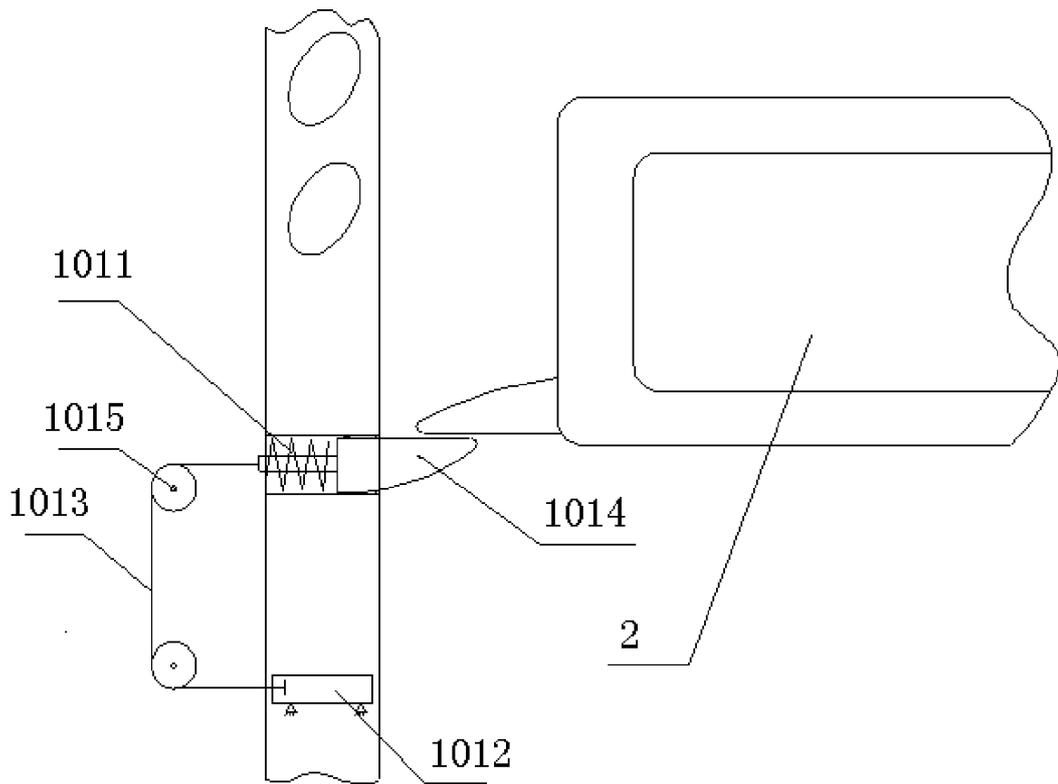


Figure 4

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2012/082655

A. CLASSIFICATION OF SUBJECT MATTER		
A61F 5/045 (2006.01) i		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED		
Minimum documentation searched (classification system followed by classification symbols)		
IPC: A61F5		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)		
CPRSABS,CNXTX,VEN,CNKI spine, verte+, chair		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	CN 101292936 A (BACKPROJECT CORP) 29 October 2008 (29.10.2008), description, page 9 line 5 to page 14 line 11, page 25 lines 26, 27, figures 1-5.	1-10
A	CN 2822564 Y (HAN, Jianming), 04 October 2006 (04.10.2006), the whole document.	1-10
A	CN 1539388 A (CHEN, Chunxu et al.), 27 October 2004 (27.10.2004), the whole document.	1-10
A	CN 201631439 U (ZHANG, Dehong), 17 November 2010 (17.11.2010), the whole document.	1-10
A	CN 1300581 A (XU, Fengyuan), 27 June 2001 (27.06.2001), the whole document.	1-10
A	JP 2092353 A (KINESHIO KK), 03 April 1990 (03.04.1990), the whole document.	1-10
<input type="checkbox"/> Further documents are listed in the continuation of Box C. <input checked="" type="checkbox"/> See patent family annex.		
* Special categories of cited documents:	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention	
"A" document defining the general state of the art which is not considered to be of particular relevance	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone	
"E" earlier application or patent but published on or after the international filing date	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art	
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&" document member of the same patent family	
"O" document referring to an oral disclosure, use, exhibition or other means		
"P" document published prior to the international filing date but later than the priority date claimed		
Date of the actual completion of the international search	Date of mailing of the international search report	
14 December 2012 (14.12.2012)	03 January 2013 (03.01.2013)	
Name and mailing address of the ISA State Intellectual Property Office of the P. R. China No. 6, Xitucheng Road, Jimenqiao Haidian District, Beijing 100088, China Facsimile No. (86-10) 62019451	Authorized officer  ZHANG, Hongmei  Telephone No. (86-10) 62085626	

Form PCT/ISA/210 (second sheet) (July 2009)

**INTERNATIONAL SEARCH REPORT**  
Information on patent family members

International application No.  
**PCT/CN2012/082655**

5

10

15

20

25

30

35

40

45

50

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
CN 101292936 A	29.10.2008	EP 1985277 A1	29.10.2008
		US 2008269030 A1	30.10.2008
		US 8021287 B2	20.09.2011
		US 2011208242 A1	25.08.2011
		JP 2008272449 A	13.11.2008
		AU 2008201579 A1	13.11.2008
		CA 2630473 A1	25.10.2008
		KR 20080095747 A	29.10.2008
		KR 101110212 B1	17.02.2012
		TW 200841870 A	01.11.2008
CN 2822564 Y	04.10.2006	None	
CN 1539388 A	27.10.2004	CN 1251652 C	19.04.2006
CN 201631439 U	17.11.2010	None	
CN 1300581 A	27.06.2001	CN 1141919 C	17.03.2004
JP 2092353 A	03.04.1990	None	

Form PCT/ISA /210 (patent family annex) (July 2009)

55